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THE AUGUST METEORS.

BY THE EDITOR.

ON the nights of August 10 to 14, and sometimes till several nights later, meteors or shooting stars, belonging to the family known as the Perseides, may be generally seen, at times showing in great numbers. Humboldt remarks that, on the festival of St. Lawrence (August 10), "fiery tears" (supposed to be the saint's) fell from heaven, and he quotes Dr. Thomas Forster as saying that in a manuscript preserved in the library of Christ's College, Cambridge, written in the tenth century by a monk, the 10th of August is distinguished by the word "Meteorodes." Thomas Forster seems to have overlooked the effect of difference of style. In the seventeenth century, when the style was corrected, eleven days were dropped* to set the calendar right; in the tenth century the difference due to style amounted only to six days; so that the worthy monk's day for "meteorodes" corresponded to Aug. 16 of our time. The same meteor system may be meant, however, as perturbations may have affected the place where this family of meteoric bodies crosses the earth's orbit.

It is interesting to compare what was said about shooting stars by Humboldt, forty years ago, with our present knowledge. Then there were sensible men who saw, in the knowledge already gathered, the means of determining many points which writers in our time too often speak of as if they were recent discoveries. Then, also, there were representatives of the sterile school of science who ridiculed the results of sound reasoning, as if it were a fanciful hypothesis; men who called themselves observers, and spoke with enthusiasm of the making of observations, the collecting of observations, the classifying of observations, of everything, in fine, connected with observations, except the attempt to understand them and determine their value, which these cleverly practical persons called mere theorising.

Thus Olmsted at Newhaven, Conn., found that during the celebrated fall of shooting stars on the night between November 12 and 13, 1833, the fire balls and shooting stars all radiated from one and the same quarter of the heavens, namely, the vicinity of the star Gamma Leonis, and did not deviate from that point, though the star changed its apparent height and direction with regard to the compass points during the time of observation. A curious observation—to be recorded, sent to some learned society, and forgotten? Not altogether so. Olmsted had a brain, as well as eyes wherewith to observe, and he reasoned that "such an independence of the earth's rotation shows that the luminous body must have reached our atmosphere from *without*. A fanciful theory, truly, said in effect the mere observers, for they proceeded to speak of meteors as though nothing of the kind had been shown. The fact is, however, they were to be excused: Olmsted's reasoning was demonstrative only for those who could follow him; he could give reasons, he could not give understanding.

So also, the occurrence of showers on particular days of the year—that is, at times when the earth is in particular parts of her orbit round the sun—was recognised by reasoning men as proof positive that meteor systems are extra-terrestrial. Humboldt, though he was not, properly speaking, an astronomer, yet studying astronomy like other sciences, with care to obtain an insight into the facts, saw the real meaning of this particular fact.

Now, of course, what was proved half a century ago by Olmsted, Encke, and others, is the accepted teaching of science. The August shooting stars gave the first obvious and easily understood evidence on the subject. When it was noticed that the larger comet of 1862 crossed the earth's track where the August meteors are encountered, every one could understand what Schiaparelli meant when he said that bodies following in the track of that comet would appear (as they passed through our atmosphere) to follow such path as the August meteors traverse, *i.e.*, paths seeming to radiate from the constellation Perseus. The beautiful reasoning of Olmsted had been neglected; the bold fancy of Schiaparelli was at once noted: not more noted afterwards when by sound reasoning he showed that his lucky guess was a true one, than when he first threw out the idea. What followed is or should be well known. Adams, by an admirable mathematical investigation, showed that the November meteors travel in a period of 33¼ years round the sun; and it was found that Tempel's Comet of 1866 traverses the self-same track. After which, it was justly regarded as proved that these meteor systems, following in the track of two comets, are in some way associated with them, and that, therefore, probably other systems of meteors are similarly associated with comets; and other comets, in like manner, followed by trains of meteoric bodies.*

The shooting stars, which will probably be seen during the next few nights after these lines appear, may be identified with the Perseids by observing whether the paths they follow—traced straight backwards—pass through the constellation Perseus. Our Star Map for August (part 39, for July 28) shows that this constellation lies rather low down towards the north-east—a little northerly—at 9.45

* The day following Sept. 2, 1752, was called Sept. 14. In some popular books of astronomy, Sept. 3 is substituted for Sept. 2, and the singular statement made that calling the day following Sept. 3 Sept. 14, involved dropping *eleven* days.—*Vide* Lockyer's "Elements of Astronomy," and other such works.

* A fact singularly misunderstood by many. Thus, in Mr. Dunman's charming "Talks about Science, just issued, it is stated that, according to "Messrs. Thompson" (Sir W. Thomson) "and Tait," the tail of a comet is "a cloud of dust from the colliding masses" [of meteors] "which the head trails behind it." Mr. Tait said something of the sort—in fact, he wrote that a comet's tail is merely a shower of paving stones; but that was before he knew what astronomers had really proved.

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on Aug. 10, and at 9.30 on Aug. 14. The constellation at those hours is moving ascendingly, and towards the east, remaining above the horizon all night. Meteors of the Perseid system may accordingly be seen at any time of the night: in greater number, but with shorter paths near Perseus; more scatteredly, but with longer paths at a distance from that constellation. As the moon will be new on Aug. 13, the opportunity for observing the August meteors this year is very favourable.

Scattered members of the August system may be seen for several days after the track of the main body has been crossed. But, as the direction in which the earth travels changes about one degree per day, science cannot admit that, as Mr. Denning opines (who has done excellent work in the observation of meteors), members of the August system can be recognised by still radiating from the proper "radiant" of this system several weeks before and after the time of central passage. To say that a shooting star on September 14, for instance, radiated from the same centre as one seen on August 14, when the earth's course was thirty degrees different, is, for the mathematician, equivalent to saying, not that they belonged to the same, but that they belonged to different meteor systems.

ENGLISH SEASIDE HEALTH-RESORTS.

By Alfred Haviland, M.R.C.S., F.R.M.C.S. Lond.

WINTER TEMPERATURES.

THE winter isotherms link together health-resorts very remote from each other; for instance, we find those on the North Coast of Wales—Bangor (58), Beaumaris (59), Penmaenmawr (60), Llandudno (61) and Rhyl (62)—participating in the same mean January temperatures that characterise the South Coast, between the isotherms 40° and 42°, within which lie places having a high repute as winter resorts, for instance:—the Isle of Wight (33), Bournemouth (34), Weymouth (35), Lyme Regis (36), Sidmouth (37), and Exmouth (38). This fact is of great moment to persons living in Central England, to whom the distance from their homes to the South Coast would often entail a prohibitory expense. Again, we find between the isotherms 42° and 43° the moister climates of Dawlish (39), Teignmouth (40), and Torquay (41), linked, so far as temperature is concerned, with the more bracing and drier resorts of the North coast of Devon and the coast of Somerset, viz.:—Linton (50), Blue Anchor (51), Burnham (52), and Weston-super-Mare (53). On the East coast there is a remarkable uniformity of the winter temperatures, as will be seen on observing how closely the 37° isotherm follows the contour of the coast, and thus links Hythe (25), Folkestone (24), Dover (23), Deal (22), and Ramsgate (21), with the health-resorts of the Yorkshire coast, which latter, however, have the greater advantages of being further removed from the Continent, and a greater sea area in front of them.

The influence of the Irish Sea on the winter climate of the whole of the west and north coasts of Wales is well shown in the chart. Those resorts which lie on the coast of peninsular Cornwall have the mildest winter climate; for they are not only the most southern, but have the immense sea area of the Atlantic before and around them; even in the coldest month, January, they enjoy a mean temperature betwen the 44° and 45° isotherms, the latter of which is out of the map, as its curve is found between the Land's End and the Scilly Isles. These resorts are Falmouth (44), Penzance (45), Sennen (46), and St. Ives (47).

Buchan remarks, with regard to the effect of the English Channel on the course of the isothermals, that its greater shallowness, its proximity to the Continent (whose winter temperature is lower than that of Great Britain), and its immediate connection with the North Sea (through the Straits of Dover) waters are colder than the Atlantic at this season; it has a much less powerful influence in warming the resorts along the south coast of England than the Irish Sea has on those which enjoy the mild climate it transports to them. The rapid diminution of temperature from the Land's End eastwards to Kent is one of the most marked features of the winter temperature. The mean temperature of Helston (Cornwall), in January, is 45° 1′, from which it falls to 40° 5′ at Bournemouth, and to 38° 1′ at Canterbury.

With regard to the observation that the waters of the North Sea are colder than those of the Atlantic, we would observe that, from observations made at Scarborough for the last five years, the average January temperature of the sea amounted 41° 2 Fahr.

We should be glad to receive further information with regard to the temperature of the sea, as it is a most important factor in the climates of our health-resorts.

Communications on this or any other subject should be addressed to the Editor.

The Summer (July) Isotherms.—We have just seen how the southern seaside health-resorts are bracketed with the Northern during the winter by means of the isotherms produced by the gulf stream; we shall now see how the two opposite coasts of England are, as it were, brought together by the *sun-heat isotherms*. In the first place, we notice that these summer isotherms arch northwards over the land, showing that the sun-heat's influence is felt in higher latitudes than over the sea, where in fact we find the distances between each isotherm have been considerably lessened by the cooling influence of the equable sea temperature.

Beginning from the VI. zone, we find that nearly all the south-west resorts lie to the south of the 63° isotherm, and that a greater part of Devon and the whole of Cornwall lie between it and the 64°. We must also note the effect of the large masses of land in the IV. and V. interlatitudinal zones in extending the sun's influence over the large area embraced within the 63° isotherm, and further observe how, in the central position of the latter zone, the mean temperature for July reaches to 64°. The Climate Chart, at p. 163, sufficiently explains which of the several resorts on the east and west coasts of England and Wales share the same isothermal zones, and obviates further description.

We have now seen what resorts, owing to their position on the sea-board, enjoy the warm, moist air from the gulf stream; we must now point out which of them have their climate influenced by the bracing airs of the North Seas. It must be remembered that the winds do not, as a rule, in these latitudes blow in straight lines for any considerable distance from the several points of the compass, either over England, Wales, and Ireland, or over Scotland; but that they rather perform circuits around certain areas of low barometric pressure, and it is possible that a wind which makes its way as a north-west wind through the North Channel and over the Irish Sea to the coast of Cumberland may, after passing over 60 or 70 miles of land, find its way as a westerly wind in the Vale of York, and assume a south-westerly direction before it reaches the coast of the North and East Ridings of Yorkshire; when this is the case, which is by no means unfrequent, the south-west wind has the character of a cold and frosty current in the

winter. Any ordinary chart of the world will plainly show how, during the prevalence of winds from the North-West to the north-east by the north, the resorts on both sides of our country which lie within II. and III. interlatitudinal zones, enjoy not only the purest but the driest of sea winds, which have blown over an almost boundless area of sea; and it will be seen hereafter that these resorts, which we have just shown differ little from the southern in their winter temperatures, have climates of remarkable tonic power, which, when other factors are present, such as rock-bound coasts, &c., acting as force-breakers to the wind, conduce to the prevention in youth of the development of that dreadful disease, consumption, which in the ten years 1861-70 killed 529,425 persons.

THE HUMOUR OF THE ARYAN RACE.*

AN American writer, Miss Elizabeth Robins, has recently been working in a branch of ethnology entirely new—viz., the study of the humour of the Aryan nations; and the articles she has published on that subject are replete with new facts, the result of much knowledge and acute observation. They suggest, moreover, fresh lines of inquiry, and some account of them may not prove uninteresting to the readers of KNOWLEDGE. The primary object of all historical studies is to arrive at a conception of the growth of the human race, and to recognise in its earliest efforts and strivings the mighty source from which our present civilisation has been evolved. In such investigations it is with profound satisfaction that we discover the evidence of the working of the mind of man, and the monuments of antiquity have little value to us beyond the human interest they possess. Now, there is no faculty of man so purely human as that of humour, wherefore its study has an attraction for us that some others do not present. But it is not easy to trace with the historic development of mankind. Even now wit and pleasantry are difficult to apprehend, and fly Proteus-like from him that pursues; but of the earlier ages of our history much is lost that would enlighten us, and what remains is but little understood. Yet Miss Robins' articles throw much light on this by-way of ethnological science.

From the time when the Hindus crossed the snowy Himalayas from their primordial home, and settled by the banks of the Seven Rivers, they have maintained the mental characteristics that quickly distinguished them; and thus the Hindu of to-day represents well his ancient ancestors The dreary calm engendered in him by the climate in which he lived caused the Hindu to repine at the activity the requirements of life entailed, and his ideal Elysium was a state of perfect passivity and rest. "There never was a nation," says Professor Max Müller, "believing so firmly in another world, and so little concerned about this." This weary spirit bore fruit in the Buddhist doctrine of Nirvana, which taught the Hindu to look forward to his absorption into Atman, the One Great Self, when the toil of existence should cease, as the chief and final good. Such a metaphysical belief as this, when the essence of progress is wanting, and the tone of mind that led to it, have left a deep impress on Hindu civilisation, and have marked its literature with a special character. The Vedas of the Hindus, as Miss Robins points out, contain many sublime passages; their law-books are filled with wisdom; their epics celebrate the deeds of great heroes, and their dramatic works have a strong affinity to ours; but even in these the quiescence of the Hindus prevents the great lights of tears and laughter, the glory of the literature of other nations. In other words, they have never realised the higher pleasures and greater pains that are the lot of more sensitive men. They were apt, in their metaphysical speculations, to laugh at the folly of mankind for rejoicing or despairing in a world where there was no reality; and their humour is often so bitter and misanthropical, that it is often not easy for Western readers to distinguish that which is humorous from that which is grave. Miss Robins considers the story of Baital Pachisi to be the masterpiece of Sanskrit humour, of which it is distinctly typical. It represents the subjection of human power and wisdom to the Vampire, the representative of all that is vile, and it is withal so entertaining that it has been very popular.

Unlike their kinsmen in Asia, who with the lotus-eaters have "no joy but calm," the northern Aryans have met in their migrations with hardship and cold; and learning to value that gift of life for which they have fought so hard, they have been invigorated by labour and rewarded by its fruits. The ancient Greeks, settled in the land of Hellas, in "that fair clime where every season smiles," speedily assumed the first place in European civilisation. They enjoyed a vigorous life, in the open air; and, communing much with nature, they became lovers of the beautiful, which with them was the external form of the good. It was thus that the inhabitants of Olympus were assimilated to themselves, and became the types of the higher life of the Hellenic genius. But the Greek gods were not humorous in the sense in which we understand the word now. They were mirthful, it is true, and laughed loudly at the grotesque appearance of Pan, and at his mad tricks, but their amusement was chiefly derived from external objects and ridiculous deceptions. But the early Greeks had serious aims, and did not think the comic worthy of attention, for which reason, says Aristotle, the archon did not until late assign a chorus to the comic poets. The humour of the Romans resembled strongly that of the later Greeks, but it was of a rougher nature, consisting chiefly of satire, often bitter of its kind, with much buffoonery and broad fun.

Passing to the colder climes of northern Europe, the Scandinavian and Teutonic races depended on the chase for their livelihood, and were hardened by the toil that attended it. The old Scandinavians, stormful Jarls and Vikings, wild huntsmen and sea-goers, imbibed a taste for distant and dangerous adventure, and became brave and fearless, sharp, vigorous, and original. No pessimists they, like the Hindus, no philosophers, like the Greeks, but men with whom the stream of life ran tumultuous and cataract-like. They were rough and homely men, with big hearts and rugged exteriors, and loudly could they laugh as they quaffed their mighty ale over stories of combat bravely done. And their gods were like themselves. Even Odin, the all-father, "the terrible and severe god," could drink like a Norseman. Thus he says:

> "Drunk I was,
> I was over drunk,
> At that cunning Fialars."

But the god Loki, of whom Miss Robins has given a vigorous sketch, is the type of the Norse genius, the incarnation of mischief, full of jesting and mummery, cunning and fond of his own amusement. And his history is that of the pleasure-seeker, a quick descent from amusement to vice; and the mirthful scoffer becomes "the calumniator of the gods, the contriver of all fraud and mischief, and

* "Hindu Humour—Loki—Mischief in the Middle Ages." By Elizabeth Robins. *Atlantic Monthly*, 1881-82.

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the disgrace of gods and men." "Loki is first god, then god and devil combined, and finally devil *pur et simple*."

In her article on "Mischief in the Middle Ages" Miss Robins carefully delineates the humorous side of the English people. The middle English had a great fund of quaint humour, and a fine capacity for enjoyment. They had also a lively appreciation of the ludicrous and grotesque, and were fond of punning devices and mottoes. The mischievous nature of the Norseman, too, was in the people, but we have not space to go into the evidence which Miss Robins has collected. "As distinct as the mythology of Greece or Scandinavia," says she, "was the fairy mythology of mediæval Europe. It borrowed from the one grace and sensuous recklessness, from the other ruggedness and humour, and formed a whole of sprightly mischief." The fresh humour of fairy-land is indeed the charm of mediæval literature.

It is curious to note in these articles how the spirit of the nations has been influenced by the circumstances and climates in which they have lived, for the humour of the Hindus was inspired by fatalism, that of Greece by philosophy, of Scandinavia by hardship and warfare, and that of England by the romantic and progressive spirit of the Anglo-Saxon race.

JOHN LEYLAND.

FORMS OF CLOUDS.

BY THE EDITOR.

THERE are few more interesting and instructive subjects of study, especially at this season of the year, when so many persons have daily before them a wide stretch of sea horizon, than the clouds—whether they be the light feathery clouds called cirrus, which lie often more than ten miles above the earth's surface; or the cumulus clouds, like great masses of cotton-wool, which form on a summer's day at heights probably varying between half-a-mile, or less, and two, or, at the outside, three miles from the surface; or stratus clouds, forming a vast sheet extending to the horizon, or near it; or the various forms of cloud which accompany storms, whether of wind or rain or thunder.

In the first place, it is interesting to compare our first ideas as to the forms of cloud-masses with those which arise so soon as we reason a little on the subject. It is to be noticed that the cloud-strewn sky is always full of illusions, whatever the shapes of the clouds may be, and that, in certain cases, we are under the influence of an absolute illusion quite beyond the power of any reasoning to correct.

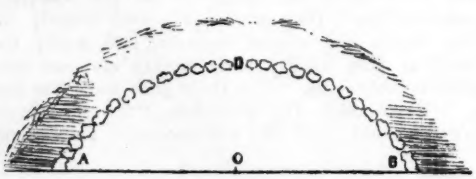

Fig. 1.

When we look at a distant landscape, and see behind hills and trees and buildings, the clouds in a sky—or an absolutely cloud-covered sky—apparently extending upwards from the horizon itself, we are unable to resist the illusion that the surface which thus forms a background to objects at which we look horizontally, is itself either vertical or nearly so. Thus, to take the case of a sky over which clouds are freely scattered. If we think of the clouds overhead at all, the idea we form of the sky canopy is that its shape in section is somewhat like what is shown in Fig. 1, where the rounded clouds fully outlined are supposed to be cumulus and the others to be cirrus. If we limit our attention to parts of the sky near the horizon, we are very apt to imagine that the cloud-surface seen at A or B—which often appears continuous even when the clouds overhead are widely scattered—is upright.

Now, in reality, on a day when the air in which cumulus clouds are suspended (to use an inexact but convenient term) is very clear, as it often is, the cloud-surface which is the background to hills, trees, and buildings forming the landscape in any direction, is much more nearly horizontal than vertical. The shape of the cloud canopy,

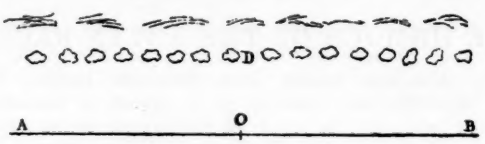

Fig. 2.

instead of being what is represented in Fig. 1, is more like what is represented in part only (for very obvious reasons) in Fig. 2, where, however, the layer of cirrus clouds is scarcely shown high enough.

The real shape of the under surface of a layer of clouds two miles above the surface of the earth is, of course, what is shown in section in Fig. 3, where D is supposed to be the point over head,—if only AB be drawn long enough or OD short enough. But it would be impossible to show

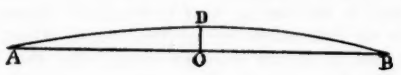

Fig. 3.

this properly on any scale available in the pages of KNOWLEDGE. If EO*c* represents the surface of the earth, ADB the surface two miles above that of the earth, and AOB the horizon plane of the spectator at O, the distance AO can be determined as follows:—Draw the diameter D*Cd*, which is roughly about 8,000 miles; then we know that

$$\text{the square of AO is equal to the rect DO, O}d. = 2 \times 8{,}000$$

if we take the mile for our unit of length. Thus

$$AO = \sqrt{16{,}000} = 127 \text{ miles.}$$

If we had taken the true diameter of the earth, we should have made AO equal to 126 miles,—the difference being not worth noticing. Thus we ought, in Fig. 3, to have AO more than sixty times as long as DO; so that if DO were a quarter of an inch long—and a shorter distance would be inconveniently small—AO would be nearly 16 inches, and AB would want only about five inches of a yard. On the scale of Figs. 1 and 2, in which the height OD is one inch, the points corresponding to A and B of Fig. 1 should be each more than five feet from O.

Thus the surface of the cloud-layer which forms the background of a distant landscape is very nearly horizontal in this case. It is still more nearly horizontal if the clouds are lower. Suppose, for instance, the clouds half-a-mile high. Then, putting OD in Fig. 4 equal to half-a-mile, we get $AO = \sqrt{4000} = 63$ miles, or AO is 126 times as great as DO.

In the case first considered, with the cumulus clouds two miles high, it can be readily shown (we do not trouble our readers with the proof) that the angle at which the cloud

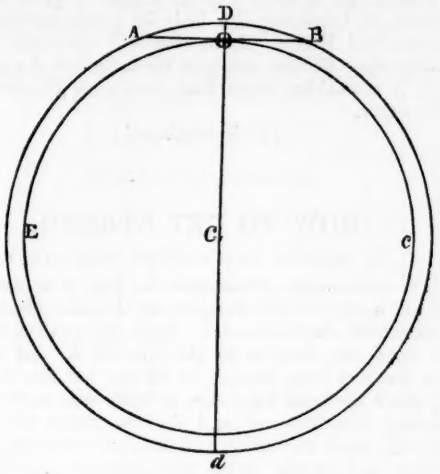

Fig. 4.

surface (which seems to meet the horizon almost vertically at A and B) is really inclined to the observer's horizon plane, is an angle of only about $1\frac{3}{4}$ degrees. In the latter case, this angle is only about 54 minutes, or nine-tenths of a degree.

If we take the quadrant BAD in Fig. 5, divide it into three parts in E and F, and FB again into three parts in *e* and *f*, then the tenth part of B*f* is a degree, and BA*d* represents the larger of the angles just mentioned. Thus,

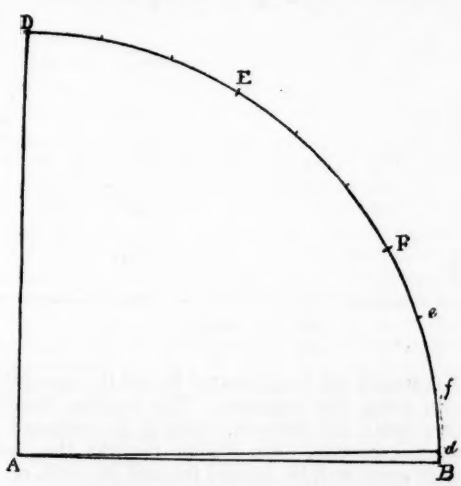

Fig. 5.

when cumulus clouds hang about two miles high in clear air, the cloud-bank near the horizon, Fig. 5, instead of being nearly vertical (or like AD), as it seems to be, is inclined like A*d* to AB. When the clouds are half-a-mile high, the inclination is only half of even this small angle.

Since, then, the cloud surface to which we pay most attention, that near the horizon, is seen thus aslant, instead of squarely, or nearly so, as we seem to see it, we can understand how much room there is for illusion as to the true forms both of separate clouds and of cloud masses. Such illusions we shall next proceed to consider.

(*To be continued.*)

LEARNING TO SWIM.

By Natator.

EVERY ONE admits that we ought all to be able to swim; yet, if you ask the first ten men you meet whether they can swim, you will find that at least five cannot, and of women (who can learn to swim much more easily than men) not one in ten can swim. Yet, out of a hundred men in all classes above the very poorest, ninety-nine have the chance of teaching themselves to swim with perfect safety, and quite easily, for one part at least of every year; and nearly the same proportion among women have similar opportunities.

It seems to me the reason why, despite the talk which goes on every year in the summer and autumn months about learning to swim, so few who might do really achieve the easy task, is that erroneous ideas are formed respecting the thing to be learned. A skilful swimmer, professional or otherwise, describes the art of swimming as eventually it should be acquired by the learner. He tells a man or boy who cannot support himself for a moment in the water—except, perhaps, by floating on his back—that he must go through such and such movements. Here is a learner's first instruction, extracted *verbatim* from an old magazine:—"Suppose a person standing up to his breast in water, and about to strike off in swimming; the hands are placed close to each other, with the palms undermost near the breast, the body is thrown forward in the water, the hands are thrust out, and when the arms are fully extended, they diverge horizontally (the backs of the hands being turned towards each other), describing curves" [excellent description], "until they are brought round under the armpits and again extended. Whilst the arms are describing their curves, the legs are drawn forwards under the body, the knees being separated as much as possible, and the toes turned outwards, and whilst the arms are regaining their extended position, the legs are extended backwards and outwards, the soles of the feet being turned outwards." Now this is very pleasant to read. So the learner, standing up to his breast, puts his hands close together, the palms undermost near the breast, throws his body forward in the water, and presently comes up spluttering, having accomplished no part of the suggested operations except "describing curves" very vaguely and very uncomfortably.

The fact really is, that the first efforts of the learner should be of a much less ambitious kind. No one ever yet learned to swim all at once; and many are prevented from learning to swim at all by the circumstance that *every one fails* who tries to do what most books on swimming tell him to do, and what professors of swimming pretend to expect him to do.

In the first place, the learner should not stand breast-high in the water, at least on a sloping shore, or where there is any stream. Not many years ago, some simple lessons on swimming, beginning with some such advice as we have quoted above, led a beginner to his grave; for, tumbling forwards in trying to carry out the instructions, he began to flounder, and floundering into deeper water, was drowned. In a bathing-place with level floor, a learner may safely take his first lessons with the water up to his

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armpits when he stands upright. But on a sloping shore (and even then he must be well assured that the slope is uniform and gradual, and the bottom such as he can stand on firmly) he should be content to stand in water some three or four inches below the armpits. If there is a stream, he will do well to fasten round his waist a stout cord, attached to some thoroughly trustworthy post on the bank. The same also at sea, if there is any tide or current, or any but the gentlest undulations. It is better also to be with persons who can swim. In fact, avoid all danger. You will not learn the worse for being safe.

So much premised, note that the first thing to be learned—the first, but after it is learned everything else comes easily—is the art of retaining the balance in the water. It is *better*, if you want eventually to be a really good swimmer—that is to have good style and pace—to avoid at first all attempts at actual swimming: it is *essential* if your opportunities do not allow you to be so ambitious, and you want chiefly to learn confidence in the water.

Lean gently forward, with the face towards the shore, extending the arms forward and outwards, with the palms down, fingers and thumb close, and the hand, thumb, and fingers hollowed so as to form a sort of shallow cup. In this shape the hands have great power to help you in balancing yourself. Lean further and further forward—moving your hands about a little, so as to feel the water and also their power on the water, until your feet begin to be no longer able to support you. By this time your shoulders are immersed, and you feel the lifting power of the water, but you are not properly balanced right and left. One shoulder or the other dips as you tumble forward, and as your feet leave the ground your head goes under, which is not what you want. After a flounder or so (which itself has a good effect in teaching you, unconsciously, how water acts on a floating body) you are ready for another trial. This time, resolve that, on whichever side you find your body dipping, you will use your cup-shaped paddle (the hand held as described) on that side, with strong downward and rather outward action. You will find this very effective in tipping you up the other way: and you will flounder quite as badly as before. After doing this a few times, now one now the other side dipping first, and being too effectively stopped, resolve to use both your hand paddles, first the one first needed to save its side from going down, then, as the other side begins to dip, the other, and then—if you have time (most probably you won't, but that, as our Editor says, is a detail) the one first used. You will now rather wobble than flounder. You finally come to grief, of course, because your method of using your hand-paddles is too energetic. You put out too much strength to save you from your first dip on one side, and so you dip over to the other side; you correct that dip too strongly, and so dip the other way. Your next care then is to moderate your balancing movements. You resolve that as you dip over you will make only a slight effort for recovery. To your surprise you find even this reduced effort tips you over; but now, if you still keep your attention directed to the alternation of the paddling action, you make more wobbles than before, before finally floundering over. You continue these experiments, reducing the action at each new trial, and learning more and more how very slight is the proper action for correcting the tendency to dip for want of true balancing. At last it dawns upon you that balancing in the water is very different from balancing in the air. The slightest movement of the hand serves to restore the balance, when disturbed; anything beyond destroys the balance. So soon as this lesson has been learned—most likely this will not be till after several days—the beginner can balance himself readily, without at first advancing, or turning, or using his legs, which as they leave the ground in these experiments may be left in any position they may naturally assume, while the learner gives all his attention to acquire ease and readiness in balancing the body by gentle movements of the arms and hands. After that will come the time for learning other things—amongst them the art of swimming, which is something more than balancing the body afloat in the water.

(*To be continued.*)

HOW TO GET STRONG.

TO EXPAND AND DEEPEN THE CHEST.

THE contrivance illustrated in Fig. 1 is due to the ingenuity of Dr. Sargent, of Boston, Mass. It is an excellent chest-expander. Over the pulleys PP cords pass from the weights to the handles A and B. The ropes are just long enough to let the handles be about a foot above the head when the weights are on the ground. Standing now between and directly under the handles, erect, the chest well filled, and the arms straight, grasp the handles, and slowly draw the hands along the course shown by dotted curves, raising the weights about 2 ft. from the ground. Let the weight slowly return to the ground, and repeat the process *ad libitum*.

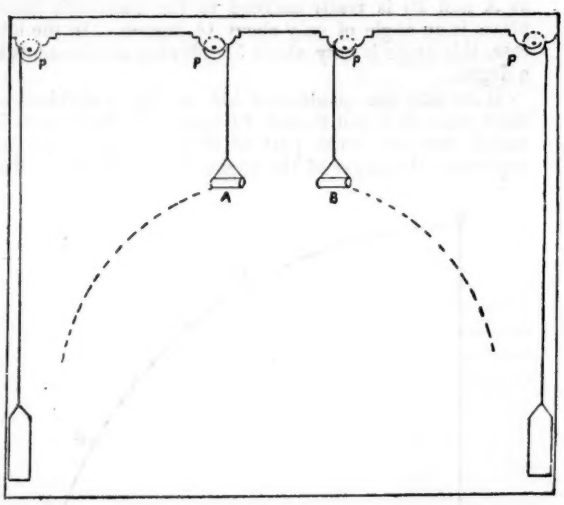

Fig. 1.

The weight can be graduated to suit the strength of the person using this apparatus. The exercise should in no degree strain the strength, while it is continued say for about five minutes. Mr. Blackie remarks that no better present could well be devised for one of weak or narrow chest than one of these appliances. Note, however, that though the picture shows a somewhat elaborate arrangement, this is not at all essential to the effective nature of this method. Two pulleys will serve as well as four, the weights may be anything whatever, dumb-bells, clubs, bags or straps with books in them—anything. No pulleys at all need be used if none can be conveniently obtained, but a couple of short stout reels, with long brass-headed nails passing easily through the holes of the reels, will serve very well, the nails being driven about an inch into a suitable wall. In all these matters, a little ingenuity will

readily enable anyone to rig up something which will practically serve as well as the best carpentered construction.

Another plan, also Dr. Sargent's, deepens the chest as effectively as the preceding expands it. In Fig. 2, B and C are two bars (broom handles, or the sticks for single-stick will serve very well) suspended by a cord which

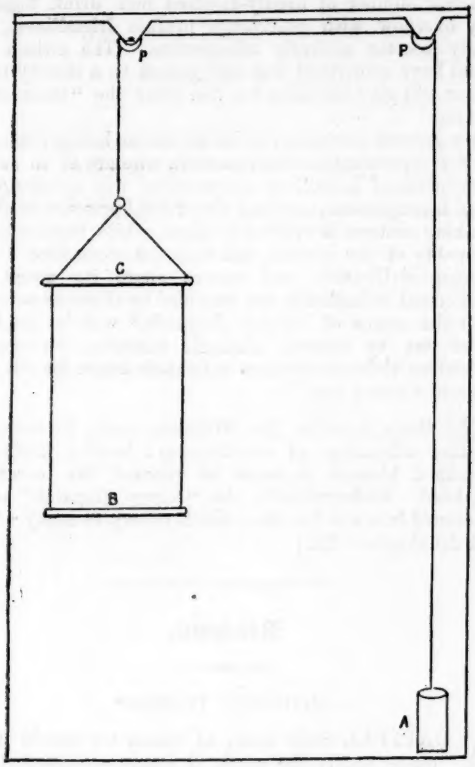

Fig. 2.

passes over two pulleys PP (but one will serve, or the reels used in the last exercise), to a weight A. When A is on the ground, the bar B is about a foot above the head. The following are Dr. Sargent's directions (unfortunately these body-strengthening folk, drill-sergeants, fencing-masters, *et hoc genus omne*, write not very clear English) :—Standing, not under B, but about a foot to one side of it, and facing it (he means, of course, a foot in front of B, and facing it), grasp its ends with both hands, and keeping arms and legs straight and stiff, and breathing the chest brimful [!], draw downwards until the bar is about level with the waist; let the weight run slowly back and repeat, *ad libitum*. (It will be seen that the contrivance does not require the rod C, any more than it essentially requires two pulleys.)

In a former paper, we remarked that, instead of the cords with weights, elastic extensors could be used, by attaching them to high nails and hauling upon them. After trial, we withdraw this statement. The exertion required when extensors are used varies too much to be comparable with the steady work of pulling up weights : it is a serious fault, too, of all work with extensors that the effort required increases from beginning to end of the pull.

Lastly, for chest work, though many of the other exercises for obtaining symmetrical development will tell on the chest also, try the following with light—say six pounds'—dumb-bells. Holding the head and neck back so as to look at the ceiling, the dumb-bells hanging at the sides, knuckles out, carry the arms, without bending the elbows, outwards and upwards until they are in a horizontal line, then onwards in the same wide sweep until they are vertical, lowering the hands then gradually until the dumb-bells nearly rest on the shoulders; carry them backwards by the same movements exactly reversed. Repeat this ten or twelve times—twenty or thirty if you conveniently can ; but keep the chest well expanded all the time, holding in the breath during the effort—if possible during the whole series of efforts (only not continuing to hold the breath when actual pain begins to be felt). This exercise has a splendid effect in making the chest full and deep : it also greatly strengthens the lungs.

THE USE OF DRUNKENNESS.*

By W. Mattieu Williams.

IN the early argumentative struggles between the advocates of total abstinence from alcohol and their opponents, the latter believed they settled the question by affirming that "these things are sent for our use," and therefore that it was flying in the face of Providence to refuse a social glass. This and many similar arguments have subsequently been overturned by the abstainers, who have unquestionably been victorious "all along the line," especially since Dr. B. W. Richardson has become their Commander-in-Chief.

In spite of this, I am about to charge their serried ranks armed with an entirely new weapon forged by myself from material supplied by the late Dr. Darwin, my thesis being that the drunkenness which prevails at the present day is promoting civilisation and the general forward progress of the human race.

Malthus demonstrated long ago that man, like other animals, has a tendency to multiply more rapidly than the means of supporting his increasing numbers can be multiplied ; he and his followers regarded this tendency as the primary source of poverty and social degradation. Darwin, starting with the same general law, deduces the very opposite conclusion respecting its influence on each particular species, though his antagonism to Malthus does not prominently appear, seeing that his inferences were mainly applied to the lower animals. Darwin shows that the onward progress, the development, or what may be described as the collective prosperity of the species, is brought about by over-multiplication, followed by a necessary struggle for existence, in the course of which the inferior or unsuitable individuals are weeded out, and "the survival of the fittest" necessarily follows; these superior or more suitable specimens transmit more or less of their advantages to their offspring, which still multiplying excessively are again and again similarly sifted and improved or developed in a boundless course of forward evolution.

In the earlier stages of human existence, the fittest for survival were those whose brutal or physical energies best enabled them to struggle with the physical difficulties of their surroundings, to subjugate the crudities of the primæval plains and forests to human requirements. The perpetual struggles of the different tribes gave the dominion of the earth to those best able to rule it ; the strongest and most violent human animal was then the fittest, and he survived accordingly.

Then came another era of human effort gradually culminating in the present period. In this, mere muscular

* From the *Gentleman's Magazine*.

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strength, brute physical power, and mere animal energy have become less and less demanded as we have, by the aid of physical science, imprisoned the physical forces of nature in our steam boilers, batteries, &c., and have made them our slaves in lieu of human prisoners of war. The coarse muscular, raving, yelling, fighting human animal that formerly led the war dance, the hunt, and the battle, is no longer the fittest for survival, but is, on the contrary, daily becoming more and more out of place. His prize-fights, his dog-fights, his cock-pits, and bull-baiting are practically abolished, his fox-hunting and bird-shooting are only carried on at great expense by a wealthy residuum, and by damaging interference with civilised agriculture. The unfitness of the remaining representatives of the primæval savage is manifest, and their survival is purely prejudicial to the present interests and future progress of the race.

Such being the case, we now require some means of eliminating these coarser, more brutal or purely animal specimens of humanity, in order that there may be more room for the survival and multiplication of the more intellectual, more refined, and altogether distinctively human specimens. It is desirable that this should be effected by some natural or spontaneous proceeding of self-extinction, performed by the animal specimens themselves. If this self-immolation can be a process that is enjoyable in their own estimation, all the objections to it that might otherwise be suggested by our feelings of humanity are removed.

Now, these conditions are exactly fulfilled by the alcoholic drinks of the present day when used for the purpose of obtaining intoxication. The old customs that rendered heavy drinking a social duty have passed away, their only remaining traces being the few exceptional cases of hereditary dipsomania still to be found here and there among men and woman of delicate fibre and sensitive organisation.

With these exceptions, the drunkards of our time are those whose constitutions are so coarse, so gross and brutal, that the excitement of alcoholic stimulation is to them a delicious sensual delirium, a wild saturnalia of animal exaltation, which they enjoy so heartily that every new raving outbreak only whets their appetite for a repetition. While sober they actually arrange and prepare for a forthcoming holiday booze; work and save money for the avowed purpose of purchasing the drink and its consequent ecstasies, which constitute the chief delights of their existence. When a professional criminal has "served his time," and is about to be released from prison, his faithful friends club together to supply him with the consolation of an uninterrupted course of intoxication; the longer its duration the greater his happiness and the deeper his obligations of gratitude to the contributing pals.

We know that such indulgence has swept away the Red Indian savage from the American continent, and prepared it for a higher civilisation, as the mammoth and grisly bear have made way for the sheep and oxen; and this beneficent agent, if allowed to do its natural work, will similarly remove the savage elements that still remain as impediments to the onward progress of the more crowded communities of the old world. If those who love alcoholic drinks for the sake of the excitement they induce are only supplied with cheap and abundant happiness, our criminal and pauper population will be reduced to a minimum.

It is commonly supposed that because nearly all criminals are drunkards, therefore drunkenness is the chief cause of crime. This is a confusion of cause with effect. Crime and drunkenness go together because they are concurrent effects of the same organisation. Alcoholic stimulation merely removes prudence and brings out true character without restraint or disguise. The brute who beats his wife when drunk would do so when sober if he dared and could; but what we call the sober state is with him a condition of cowardly depression and feebleness due to the reaction of intoxication. If a number of quarrelsome men assemble and drink together, they finish with fighting. If a similar number of kindly-disposed men drink together, they overflow with generosity, profuse friendliness, and finally become absurdly affectionate. The citizen who would have subscribed but one guinea to a charity before dinner will give his name for five after the "toast of the evening."

My general conclusion is that all human beings (excepting the few dipsomaniacs above-named), who are fit to survive as members of a civilised community, will spontaneously avoid intemperance, provided no artificial pressure of absurd drinking customs is applied to them, while those who are incapable of the general self-restraint demanded by advancing civilisation, and cannot share its moral and intellectual refinements, are provided by alcoholic beverages with the means of "happy despatch," will be gradually sifted out by natural alcoholic selection, provided no legislative violence interfere with their desire for "a short life and a merry one."

[In these remarks, Mr. Williams omits to notice yet another advantage of drunkenness: besides killing the drunkard himself it tends to prevent the increase of his kind. Unfortunately, the "happy despatch" of the drunkard involves too often much misery to many who are not drunkards.—Ed.]

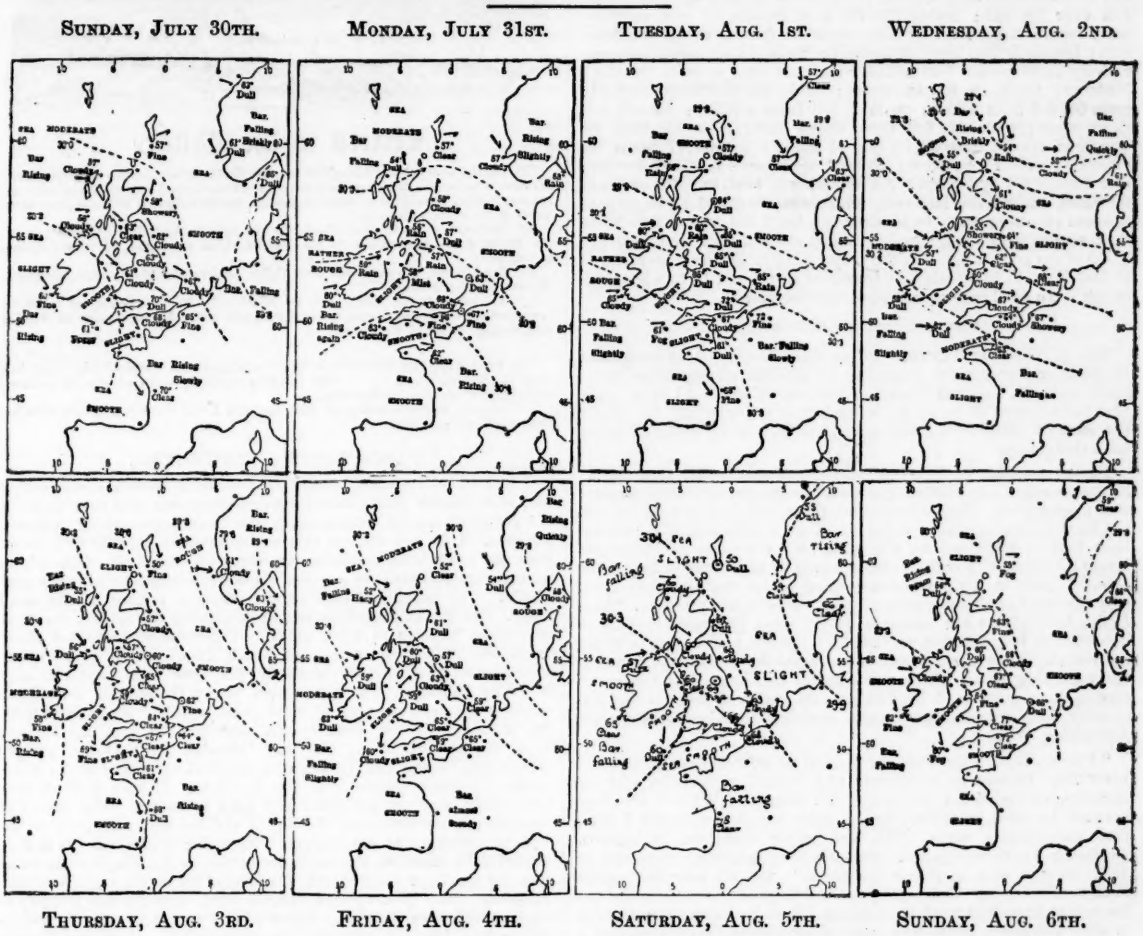
Reviews.

MODERN DRESS.*

A CAPITAL little book, of which we should like to quote nearly the whole if space permitted, and it were quite fair. Dr. Pearse considers clothing in its relation to animal heat, cleanliness, circulation, respiration, and muscular development; he also touches on the methods by which infection may be conveyed by means of clothing. The following remarks on the question of braces *versus* belts will be interesting to many correspondents who have written about them, and give a good idea of our author's style. "The use of braces in weakly men makes them stoop. They naturally press upon the chest, and men would find their chests much freer without them. To those who are not accustomed to wear braces they are not only uncomfortable but cause great physical uneasiness. The objections to belts are of a different character. By being tight round the abdomen, they interfere with the natural process of respiration" [also with the process of circulation], "and if any special exertion has to be gone through they are doubly injurious. By preventing the enlargement of the abdomen, which occurs naturally at every inspiration, and more particularly when straining, they press injuriously the contents of the abdomen against its walls. This increased pressure during active exertion on parts which are not protected by the belt frequently causes rupture. No one would think of putting a tight band round a horse if he wanted it to run a race, and why should it be put round the human body under similar cir-

* "Modern Dress; and Clothing in its Relation to Health and Disease." By T. Frederick Pearse, M.D. (London: Wyman & Sons.)

WEATHER CHARTS FOR WEEK ENDING SUNDAY, AUG. 6.



In the above charts the dotted lines are "isobars," or lines of equal barometrical pressure, the values which they indicate being given in figures at the end, thus—30·4. The shade temperature is given in figures for several places on the coast, and the weather is recorded in words. The arrows fly with the wind, the force of which is shown by the number of barbs and feathers, thus:— ⟶ light; ⟶, fresh or strong; ⟶, a gale; ⟶, a violent gale; ⊙ signifies calm. The state of the sea is noted in capital letters. The * denotes the various stations. The hour for which each chart is drawn is 6 p.m.

cumstances, or during violent muscular exercise? Working men have got into the habit of wearing these belts, but they little know the danger and disadvantages which they put themselves under. . . . The best method of supporting the trousers is to wear a belt round the abdomen below the level of the hip-bones, and passing between the top of the hip and the prominence of the thigh-bones. This is also the most comfortable method of suspending the trousers, and if worn in this position it cannot unduly press upon the abdomen."

Some views of our author are open to discussion, but in the main his views are such as all persons of sense will agree with him in. We must demur to Dr. Pearse's statement that the toes, unless altered by wearing pointed boots, are as shown in fig. 8, p. 51. He will find no single foot in ancient or modern statuary with the toes directed straight forwards (when the feet are set together). In the Victory of Melos (the so-called Venus of Milo) the slant of the toes is marked, and we may be sure the model had not worn pointed boots.

THE PUBLIC HEALTH.

THE Registrar-General's weekly return shows that the annual rate of mortality last week in twenty-eight of the largest English towns averaged 19·6 per 1,000 of their aggregate population, which is estimated at 8,469,571 persons in the middle of this year. In London 2,577 births and 1,399 deaths were registered. Allowing for increase of population the births were 21, and the deaths no fewer than 397, below the average numbers in the corresponding week of the last ten years. The annual death-rate from all causes, which had been equal to 18·1 and 17·7 in the two preceding weeks, rose last week to 18·8. During the first four weeks of the current quarter the death-rate averaged only 18·0 per 1,000, against 20·8 and 25·0 in the corresponding periods of 1880 and 1881. The 1,399 deaths included two from small-pox, 40 from measles, 47 from scarlet fever, nine from diphtheria, 63 from whooping-cough, 1 from typhus fever, 16 from enteric fever, 2 from ill-defined forms of continued fever, 108 from diarrhœa and dysentery, and 6 from simple cholera; thus, 294 deaths were referred to these diseases, being 255 below the corrected average number in the corresponding week of the last ten years. Different forms of violence caused 56 deaths; 45 were the result of negligence or accident, among which were 23 from fractures and contusions, 2 from burns and scalds, 10 from drowning, and 6 of infants under one year of age from suffocation. The death of a female in

the Middlesex Hospital was referred to "asphyxia when under the influence of chloroform and ether." The 23 deaths from fractures and contusions were thus caused:—Two males, each aged six years, run over by cab; males 35, 65, and female 57 run over by van; female 2, run over by cart; male 30 (intoxicated), fell from cart; female 5, run over by tramcar; male 18, crushed between railway carriages at Rotherhithe; male 29, run over on Midland Railway; male, 10 fell in street; male 55, fell from scaffold; male 68, fell from ladder; male 1, fell from window; male 2, fell down steps; male 34, fell down ship's hold; male 14, blow by handle of truck; male 30, by fall of bricks; female 17 hours, by fracture; male 10, by blow; male 63, by injury; female 2, by fall; and female 63, by injury. An inquest was held in each of these 23 cases, except the last two, which were certified by registered medical practitioners. In Greater London 3,254 births and 1,674 deaths were registered, equal to annual rates of 34·7 and 17·9 per 1,000 of the population. In the Outer Ring 19 deaths were referred to diarrhœa, 14 to measles, 11 to scarlet fever, and 11 to whooping-cough. No fatal case of small-pox was registered.

THE ST. GOTHARD TUNNEL.—After many contradictory reports as to whether locomotives propelled by electric energy were to be used in the St. Gothard Tunnel or not, we (*Electrician*) hear again that the attempt is to be made, and that experiments, for which the sum of 180,000 fr. is set apart, are now being made at Berne with this object.

To the student of heraldry and genealogy book-plates are as interesting and valuable as the escutcheons on old church brasses and monuments. How many cases there are in which we should not have known to whom a book had once belonged, if it had not been that it contained an old plate with the arms of the owner inside its cover, although unaccompanied by any name or any other clue. I have in my possession several plates that bear on them only the arms of their owners, without either motto or name. Then, again, book-plates are valuable as in some instances they have become the only reliable examples of the arms of a family or an individual. Then there comes into account the pleasure of hunting and collecting them. How many happy half-hours has one spent among the second-hand book-shops and stalls of London and the country, looking over old volumes in search of them!—Mr. Walford's *Antiqarian Magazine*.

"FLINT JACK."—Dr. Brewer, in that marvellous compilation of his "The Dictionary of Phrase and Fable," writes:—"Edward Simpson, an occasional servant of Dr. Young, of Whitby, so-called because he used to tramp the kingdom vending spurious fossils, flint arrow-heads, stone celts, and other imitation antiquities. Professor Tennant charged him with forging these wares, and in 1867 he was sent to prison for theft." Let me take this opportunity of advising those of your correspondents who may not happen to have this work from which I have just quoted, to at once procure the same. Just two reasons for giving this advice, and I have done—(1) It will tend to lighten the labours of the learned and patient editor of KNOWLEDGE, which, in my opinion, is a very important—nay, vital—consideration; and (2) The information which one may be seeking after is, in fifteen cases out of twenty, to be found in this work.—J. W. HOWELL. [Albeit, not fully in this case; for our correspondent wanted to know when and where Flint Jack died.—ED.]

DISCOVERY OF ANCIENT RUINS IN NEW MEXICO.—The Boston *Journal* reports that important discoveries of the largest ancient ruins yet found on this continent, which extend for a distance of fifteen miles up and down the banks of the Las Animas River, about forty miles from Durango, in Rio Grande county, N. M., have recently been made. Post Office Inspector Cameron, who visited these ruins lately, believes the ancient villages were occupied by the Moqui Indians, and not by the Aztecs, as is generally supposed. He speaks of discovering a stone ruin 400 feet by 450 feet, which at one time evidently was three stories high. The walls are five feet thick. There were about 150 rooms in the building, of ten feet square each. An enterprising Yankee who has pre-empted as government land the ground on which the ruins stand, has been doing a fine business selling relics to visitors. A discovery thought important by the gentlemen of the Bureau of Ethnology was lately made there of thirteen human skeletons in a subterranean chamber of the building mentioned. This had evidently been used as a burial vault. They were wrapped up carefully in a kind of coarse cloth, and bore a close resemblance to Egyptian mummies. This cloth was of cotton, and woven with as much skill as if done at the present day, which is considered not the least interesting part of the discovery. The skeletons were perfectly preserved and clean. They were unmistakably those of Indians. A quantity of pottery of the best make was also found in this tomb.

Letters to the Editor.

[The Editor does not hold himself responsible for the opinions of his correspondents. He cannot undertake to return manuscripts or to correspond with their writers. All communications should be as short as possible, consistently with full and clear statements of the writer's meaning.]

All Editorial communications should be addressed to the Editor of KNOWLEDGE: *all Business communications to the Publishers, at the Office, 74, Great Queen-street, W.C.*

All Remittances, Cheques, and Post-Office Orders should be made payable to Messrs. Wyman & Sons.

**** All letters to the Editor will be Numbered. For convenience of reference, correspondents, when referring to any letter, will oblige by mentioning its number and the page on which it appears.*

"In knowledge, that man only is to be contemned and despised who is not in a state of transition. . . . . Nor is there anything more adverse to accuracy than fixity of opinion."—*Faraday.*

"Show me a man who makes no mistakes, and I will show you a man who has done nothing."—*Liebig.*

FAIRY RINGS *v.* RINGWORMS.

[507]—The large fairy rings on the South Downs, described by Mr. W. G. Smith (506), have been explained over and over again as the result of special manuring in the boundary track of tethered animals. I do not dispute this explanation, especially as I know they are most abundant near the edges of the chalk cliffs, where animals are tethered to prevent them from straying over the precipice. The difficulty I endeavour to remove is that of the small rings. Mr. Smith misquotes me, in describing the rings I observed as *merely* "circles of rank grass." I distinctly state that these rings had "at times a crop of small fungi dotted over them." Mr. Smith asks whether anybody has ever seen haycocks only 3 ft. in diameter. I have seen many thousands, and have made a hundred or two of such size myself. Have just measured one made a month ago, and left to test my theory. It measures 3 ft. 2 in., and was intended as a typical sample of the small heaps usually made in the first gathering of the windrows by a single outreach of the hay-rake. If rain follows each gathering, they are not disturbed until it ceases. The theory of spontaneous outspreading of fungi is old and well worn, one of the "many attempts at explanation" to which I alluded. It is very superficially based on the analogies named by Mr. Smith—the small circular specks or rings which are formed when the *mycelia* or filamentous stems of a fungus radiate from a centre and fructify at their radial terminations. These circles are, however, limited to dimensions fairly comparable to those of the ringworm fungus quoted by Mr. Smith.

Toadstools have no geometrical instinct causing them to describe circles of fifty feet in diameter, or even of three feet. They simply flourish where their omnipresent spores alight upon ground containing the special manure that serves them as food. Every cultivator of edible fungi, from Dr. Badham downwards, knows that the droppings of animals at certain times, *i.e.*, just when tethering is most needed, supply such manure. If I am right, the drip from a heap of rotting grass does the like, but, as I stated at the conclusion of my note, further observation is demanded for the confirmation of this hypothesis. W. MATTIEU WILLIAMS.

FAIRY RINGS.

[508]—I have for many years taken a great interest in the formation of the fairy rings, but cannot accept Mr. Mattieu Williams' theory of the same. I resided for a considerable period near a large dairy farm; a field on the same was quite thickly studded with these rings, of all sizes. The grass forming the rings was of a dark green, in some very coarse, in others very soft and silky; the centre of the rings was large tufts of grass. The field has never to my knowledge been mown, nor yet have heaps of manure, cocks of hay, &c., ever lain on it.

Meadows adjoining, which are mown occasionally, and in which I have often seen the hay-cocks lying for a length of time saturated with wet, are quite free from the rings. I think some other theory must be advanced to convince me, and others, that such is the cause of fairy rings. J. DEXTER.

[Several other letters received on this subject, to the same general effect, from J. Symes, Unbelieving Thomas, K. Derling, M. Hathaivey, &c.—ED.]

A CALCULATION.

[509]—The question of Pyramus, in your number of June 23, is not sufficiently explicit. He does not say under what conditions the advances are returnable, nor how long the members continue their subscriptions.

Presuming the advances are made as soon as £500 is in hand, and that they are returned by equal monthly payments, the first monthly payment commencing three months after the date of the advance, and that the members continue subscribing £12 per annum, payable monthly, until all the 500 have received advances, then the number of advances for each of 19 years will be respectively—

12	13	14	16	17	18	
19	22	23	25	26	30	
31	33	35	37	38	41	42

in all 492 advances of £500 each. The £1 monthly subscription will be required for two months longer, during which sufficient money will be received to provide for seven additional shares, with a balance in hand of £183. 6s. 8d.

The account at the end of the 231st month will stand thus:—

Amount advanced	£250,000	0	0
Returned	135,993	6	8
Due	114,006	13	4
Amount in hand	993	6	8
	£115,000	0	0

equal to subscriptions for 230 months. The calculations leading to this result are at your service, if you would like to see them, but being somewhat lengthy, I will not now trouble you with them.

Walworth, July 20, 1882. J. Wareham.

BREATHING THROUGH THE NOSE—TURKISH TOBACCO.

[510]—Mr. Hume in his letter (No. 444, p. 79) shows the necessity of breathing through the nostrils, and I heartily agree with him. He is, however, not quite correct in his explanation of the soothing effect of tobacco-smoke upon me, as it has always been my custom to breath in the manner he advocates, and find it difficult to manage the operation in any other way. Again, I cannot corroborate Mr. Hume's opinion that the nose acts as a filter to the fumes of acid, because, though dust or any solid substance would be separated in that way, yet anything of a gaseous nature would be as little retarded as common air. It is quite probable that a portion of the fume would condense within the nasal organ; but this would only *lessen* the evil, and not eradicate it. Whatever is the true cause of the soothing effect of tobacco-smoke, it is not due to filtration; if it were so, there would be no need to smoke, as keeping the mouth closed would be sufficient.

Another correspondent (No. 445, p. 79) endeavours to show that I am "a little bit out" in regard to the tobacco used by the Turks for the Nargilé. I am always ready to be convinced that I am wrong, when I find that the experience of a majority is contrary to mine; but for the present I will persist in what I have stated in my former letter. And I am not alone in my belief, as several Englishmen residing in Constantinople had warned me against the noxious Tombeki before I tried the experiment myself. Théophile Gautier, in his "Constantinople of to-day," says, "that the Tombeki is of a darker colour than the other kinds, and is so strong that it cannot be smoked until after two or three washings." Perhaps I had the misfortune to make the trial upon *un*-washed Tombeki; or it may be that the keeper of the Café played his "little joke on the infidel"—who can tell? "A Constant Reader" recommends me to try our English forms of tobacco. Does he think it probable that I would attempt a trial of Tombeki, if I was not already well accustomed to the use of English tobacco? For his information, I may say that I am no tyro in the practice of smoking, and have used nearly all kinds of the weed that can be obtained in England or abroad. The Turk may enjoy his Nargilé, but give me my English pipe, and I guarantee to find as much solace in it as the Turk does in his.

"Another case of neglected opportunities!" says my friend. I wonder has he never neglected any himself? His belief that the Turks are temperate in *all* things, seems to ignore (or neglect) the existence of Harems. W. O. Prosser, F.C.S.

BRAIN TROUBLES.

[511]—As yet I have noticed no cure mentioned in your journal for the "Brain Troubles" that have justly received attention in it. Upon this subject perhaps I may speak with authority, as I am well accustomed to various forms of brain trouble.

Of course, the most important indications are to restore the health, if lost, and to keep the bowels fairly loose. It is a good plan to wear flannel next the skin throughout the year. A variety of out-door exercise is essential. But from personal experience I am convinced that there is nothing to be compared with mathematics, say, an hour's tussle with geometrical problems two or three times a day. In this way I have astonished myself with the cures I have effected.

Above all things, avoid strychnia (or nux vomica) and quinine, and the like. I have known even stomachic tonics, such as chamomile, do much harm. H. S.

[We quite agree with H. S. about the mind-quieting qualities of mathematics; but mathematical studies are not to the taste of all, and would only worry many. They are in my own case wonderful pain-soothers. The toughest parts of my treatise on Cycloidal Geometry were written when I was suffering intense pain from renal calculus, to which until the last few years I was much subject.—Ed.]

[512]—The quotation of your correspondent, W. M. M. (letter 468, p. 117), very accurately describes a trouble from which I suffered terribly five or six years ago, but of which I completely cured myself. In my case it took the form of doubts as to the safety of deeds, letters, &c., which were in my care and could not be replaced if lost, as to the correctness of technical and other details in documents prepared by me, as to whether I had really turned off the gas in my bedroom at night, and a number of similar matters, such as a man in sound mental health attends to daily without finding in them any cause for anxiety or worry. In each of such cases, no doubt, any neglect or omission might have led to serious consequences, and the thought of the possibility of these results following weighed upon me so that I at length became quite unable to accept the testimony of my senses to the fact that I had done what I intended to do in any matter of importance. I attribute the mischief solely to "nervousness" arising from excessive brain labour. My professional work and many of my everyday social duties were fast becoming an unbearable burden, and I felt that I had before me the prospect of failure in life, when, upon the advice of a friend, I adopted a simple expedient which led to my cure. I promised him and myself that on a certain day I would do everything I had to do carefully, once for all, and then absolutely leave it, let the consequences be what they would. I did so on that day, on the next, and so on, reporting to my friend periodically that I had faithfully kept my promise. At first I had an arduous struggle, but I felt it was then or never, and I persevered; nothing happened to me and I gradually gained control of myself, and at last I was completely free from my fetters.

I hope my experience may be useful to others. Mintaka.

BICYCLES.

[513]—I am not sure whether the subject of "bicycles" is much in your line as the Editor of Knowledge; but as the matter I write of possesses a mechanical interest, you will, I doubt not, whether you insert my letter or not, give it your usual courteous consideration, and say whether you think my ideas correct.

In the best bicycles both wheels are mounted on ball bearings, as these run more easily. But in machines of a commoner kind, the front wheel only has ball bearings, while the hind one is mounted on cone bearings. Cone bearings are much stiffer than balls; that is, there is more friction. Now this, Sir, is the point to which I wish to draw your attention. The hind wheel of any ordinary 54 in. bicycle is never less than about 18 in. Hence it revolves three times as fast as the front wheel, and, other conditions being the same, would have three times the friction at its bearings. From this it would seem that the order of things with regard to the bearings should be reversed, and that the hind wheel should have ball bearings, and if we must have cones at all they should be in front. I have never put the case to anyone in this light, but I have more than once asked why ball bearings are put on the front wheel rather than on the other. The answer I received was, that there is more weight on the front than on the hind wheel. This I admit, but I do not think there is such a difference in pressure on the bearings as will justify anyone in asserting that the front wheel has more friction than the hind one. The friction due to pressure varies as the pressure. We can assign to each wheel its share of the pressure.

I measured a 54-in. roadster to-day. The distance between the centres of wheels was 36 in., while the saddle was only 11 in. behind the centre of the front wheel. Hence the pressures on the wheels are as 25 : 11, or very little more than 2 to 1. And since this is not so great as the relation between the friction due to revolution of the wheels, I think it does not justify the practice of putting ball bearings in the front instead of in the hind wheel.

Having stated my case, I should be glad, Mr. Editor, if you would kindly give me your opinion, and if I am in error, show me the error. Thanking you beforehand for the trouble you have taken in reading my letter, I am, Thos. B. Walker.

XUM

Answers to Correspondents.

*** All communications for the Editor requiring early attention should reach the Office on or before the Saturday preceding the current issue of* KNOWLEDGE, *the increasing circulation of which compels us to go to press early in the week.*

HINTS TO CORRESPONDENTS.—*1. No questions asking for scientific information can be answered through the post. 2 Letters sent to the Editor for correspondents cannot be forwarded, nor can the names or addresses of correspondents be given in answer to private inquiries. 3. Correspondents should write on one side only of the paper, and put drawings on a separate leaf. 4. Each letter should have a title, and in replying to a letter, reference should be made to its number, the page on which it appears, and its title.*

G. JARRATT. *Verbatim* reports of the Association lectures and papers would scarcely fit in with the plan and purpose of KNOWLEDGE. They might be (though even that is doubtful) exactly described, but unless this meeting differs very much from others, they would not be very simply worded. What I hope to do is to give the essence of the more interesting communications. I may probably attend this meeting. Hitherto I have been deterred from attending such gatherings by the general prevalence of the cant of science and what may be termed, without disrespect, scientific fogeydom. The real purport and purpose of scientific research, as well as the true value of scientific discoveries, seem often overlooked at these meetings, while the guiding principle seems to be, "Claw me and I'll claw thee." The great object which the association should set itself is the humanising of science. Even those of our best scientific workers who have consented to help (our Darwins, Spencers, Mills, &c., have kept persistently aloof) have appeared at their weakest "in this association." Still good work has been done at these gatherings on occasion; let us hope it may be so on this occasion.—G. E. A. The inscription is not on the top of the boss, but, as should have been stated in the paper, on the sloping side. If the date be genuine (and the letters were there certainly fifty-eight years ago), and if the accretion from the calcareous water continuously passing over it a film of only one-twentieth of an inch has been arrested, the measure of rate of deposit will err rather by being too low than too high.—JOS. OFFORD. Many thanks. The subject has great interest for me. The pictures, if not too expensive to engrave, would be very acceptable.—DIFFICULTY. I should say, "Give it up"; if, then, you find it can be done without trick, send it to me, with solution, for a problem in KNOWLEDGE. *I* give it up.—A. (1) You perplex me. In one sentence you say you know scarcely anything of astronomy or physics; in another you decide very positively and authoritatively (also quite wrongly, but that is scarce worth mentioning) a question which can only be dealt with by astronomers and physicists. You speak very flatteringly of my knowledge and Dr. Ball's; but speak of our obstinacy in adhering to the idea that the earth was once red hot, or white hot; asking, then, whether gases could consolidate without cooling, even allowing they were hot at first—a question which really shows that you have not a clear conception of what is at issue. "Another century will explode the fallacy;" in other words, you are a century ahead of the astronomers of to-day—yet later on, "One more silly question; does the moon revolve in the same relation to the earth as the earth does to the sun? . . . I feel quite ashamed of my stupidity." The answer to the question is, of course, "No;" but . . . *is* it silly?—and *are* you stupid? If you really thought so, would you tell Dr. Ball and myself we are building on a "miserable delusion?" 2. My "private sentiments" about vivisection are tolerably well known. I abominate cruelty to animals as much as you can; it indicates an utterly detestable nature; but I consider those who would stop scientific inquiries, primarily directed to the diminution of pain and the saving of human lives, because they cannot be conducted without pain to animals (assuming all possible care taken to limit and, where possible, prevent pain) to be cruel in much greater degree than those even who wilfully torture animals. If one dear to me were suffering under a painful disease, and I were told that there was a good chance, or even any chance at all, that by an experiment conducted on an animal a means of cure might be found, I know that I should say let the experiment be tried as quickly as possible; give as little pain as possible; if not inconsistent with the nature and object of the experiment, use anæsthetics; and, if the experiment be such that the animal would suffer afterwards, destroy it immediately after the result of the experiment has been secured. I *know* I should decide thus, and—pardon me for saying it—I am certain that under similar circumstances you would decide so too. Now, what right have you or I to decide so, in a case where a human sufferer is very dear to us—father or mother, husband or wife (as the case may be), brother, sister, son, daughter (grown up, young, or infant), and to denounce a practice which, as conducted by every student of science worthy to be called man, is simply the generalisation of the special act I have considered? Do you think the sufferers among the multitudes unknown to you, among the poor, in hospitals, and so forth, have no friends or relatives who think more of their real sufferings than of the problematical tortures (or say even they were real) of chloroformed animals? Think of those dearest to you in suffering, and ask how you would decide, were such a question put to you as I have suggested; when you have quite made up your mind that you would execrate the man who should try the experiment for your dear one's relief, you may begin to objurgate the general practice; but *not* as a tender-hearted being, in my judgment.—J. E. OKILL. You are as extreme about abstinence from stimulants as A. about vivisection. It is sheer nonsense to say in the face of all experience that there is no innocent use of stimulants, and that, whatever be taken, there will be a craving for more which very few can withstand, "for we know scientifically that each drop is but a link in the forging of the chain which may probably bind and drag them down to poverty or insanity." Nine out of ten who take wine, or beer, or spirits in moderation, do not know what craving for liquor means, at least by any experience of their own. During two parts of my own life (in 1859–60, in 1879–81) my daily consumption of liquor has been in excess of what would be considered prudent by medical men; and at other times (for nine months in 1866-67, for eighteen in 1877–78, and recently for short periods) I have taken no stimulants at all, and for the rest of the time, since I was sixteen or seventeen, I suppose not a day has passed that I have not taken either a glass or two of wine, or a pint or so of ale, or a glass or two of spirits and water per diem. In all those years, now nearer thirty than I could wish, I have never known what *craving* for liquor is. I have often felt exceeding thirsty, when taking much exercise, with the feeling that I would much rather drink a glass of ale than a glass of water, and that it would do me more good: but I have never felt a craving even for a glass of ale, and (being told ale was not good for me) I suppose I have not taken so much as half-a-dozen glasses of ale per annum for the last ten years. It is the same with nearly all men I know; they can be very moderate, or totally abstain, or take a plentiful allowance, just as they may choose. If the weaker brethren want the stronger to go without stimulants for their encouragement, well and good. I don't believe much in those weaker brethren *being* encouraged. When they want an excuse to backslide, they are pretty sure to find one. But, if it were made clear to me that I could do them good by joining the ranks of the professed abstainers, I would do it,—provided I found it agree with me; otherwise, not.—J. PARKER FOWLER. See preceding reply. If, however, you find my "airing my views," (and I suppose Airy airing his) about the transit of Venus, akin to the display of Blue Ribbon by the pledged ones, I should fancy argument useless. But experience has again and again shown that common-sense restrictions have in the long-run much more effect than extreme measures. Drunkenness is never quite so rife anywhere as where teetotal movements have for awhile been most successful.—J. GOMPERTZ MONTEFIORE. I also was rather perplexed by the statement that Edward, called Plantagenet, was the twenty-fifth king of England. I suppose in French histories of England they count the Saxons, Danes, &c. Perhaps they call Alfred the first king of England, or, starting from Egbert, drop out some. I know of no English history in which Edward, surnamed Plantagenet, comes out twenty-fifth.—L. E. L., M. REARDEN. Please repeat botanical question. M. R. desires to know where in London there is an extensive retail mart for books of general literature, light reading, works out of print. M. R. thinks that as regards whist, and games of chance generally, ignorance is bliss. —*De gustibus*, &c. I find in whist capital rest after work; the more I play it the less it seems to me a game of chance.—J. PARKER FOWLER. Thanks for experiment in willing game. The third showing a danger attending such experiments is worth noting, but we have admitted a letter calling attention to that point.—G. HODSON. We have subjects more pressing than organ playing.—SIGMA. I doubt if study occasions the mind trouble described by W. M. N. Steady mind work rather tends to cure it.—E. C. K. Yes; Venus can be clearly seen on the sun's face without a telescope. Of course, a smoked glass would be necessary.—A SCOTCH SUBSCRIBER. Messrs. Coxwell & Glaisher reached a height of about 6½ miles, though French aeronauts are disposed to deny this. At a height of 7 miles the atmospheric density is reduced to about one-fourth; the density of hydrogen at atmospheric pressure is only about 7-hundredths, say one-fourteenth that of air, so that, supposing the balloon did not allow the hydrogen to expand, as with the diminished pressure it would tend to do, there would still remain ascensional power at a height of seven miles, but, of course, very much less than at the earth's surface. The lifting power at the earth's surface is equal to about 13-14ths the weight of the balloon's content in air at sea-level; at a height of seven miles it amounts but to about 5-7ths the weight of the same content in air of one-fourth the density at the sea-level, or is less in the same

degree that 5-28ths are less than 13-14th or 26-28ths. It is thus less than a fifth of what it had been at the earth's surface.—W. Cave Thomas. Many thanks for abridgment. It relieves from a difficulty.—Squirt will be much obliged by any information about table fountains.—E. H. Pressure varies directly as the height of the barometer.—W. Southall. A botanical account, by a botanical writer, shortly.—J. C. L. The peculiarity you notice is due to aberration. So far as precession is concerned, the R.A. of Sirius is steadily increasing throughout the year by about 2½ sec.; but as, owing to aberration, Sirius appears to move in a small ellipse, whose major axis is 40½" or 2⅔ sec. in length, the steady increase due to precession is converted into an apparent alternate increase and diminution, the increase being the greater.—Lux. The *cause* of the earth's tilt is unknown; but it cannot be that you suggest. If any terrestrial cause were to carry the seas to the northern hemisphere, the tilt would not be appreciably altered.—S. P. A slip for Israel, no doubt.—J. E. Brodie sends us accounts of the Gas-light and Coke Company showing that the residual products, including coke, do not amount (as Mr. W. M. Williams said in his article on Electromania) to half the cost of the manufacture of gas, and in Bristol not to 40 per cent.

ELECTRICAL.

J. H. Ward.—1. Be careful to well soften the iron wire. 2. Three layers of No. 18 or 20 cotton, covered and paraffined, will suffice for the primary coil. 3. The secondary coil should be well insulated from the primary by several layers of paraffined paper. You may use No. 36 or 38 wire, but it should be silk-covered. It is no economy to use cotton-covered wire, because the insulation necessary to compensate for the poorness of its insulating properties more than neutralises this or any other counter advantage. The length of the secondary wire will depend upon the kind of spark you require. If you want a short, thick spark, make a comparatively short, thick coil, but if you desire a long, sharp spark, then the length of your coil must be greater in proportion to its diameter. A very convenient proportion is to make the total diameter about one-third of the length. 4. The paper you send is not the best; you will find it better to use one layer of paraffined foreign note paper; with silk-covered wire this will be quite sufficient. Have you determined to make your coil of uniform thickness from end to end?

THE TELESCOPE.

Geo. Harrison. You are quite right about δ Herculis. *Culpa nostra.* On the very day on which your queries were received we had been writing a description of another star, and, in a manner absolutely inexplicable to us, seem to have repeated part of such description in our reply to yourself. The comes is really, as you say, nearly vertically over the larger star. Our statement that the position angle has only varied some 22° during the last eighty-two years is, however, strictly correct.—J. N. Colley. You have got hold of one of the old Gregorian telescopes, with metal reflectors. The loss of light in this form of instrument is very serious indeed, as it has to undergo double reflection (with its consequent great absorption), besides its transmission through the eyepiece. This may, possibly, be aggravated, in the case of your own acquisition, by the dirtiness of the mirrors. If they are clouded or speckled, you may buy a little citric acid and water and a very soft wash-leather as a means of removing impurities; but, we must repeat, the fundamental principle of the instrument itself must always cause a serious loss of light.—Comet. You do not even now furnish the information whether your telescope is mounted (so to speak) at the *top* of the polar axis, or on one side of it. If the former, you must, perforce, turn the instrument round to reach the pole, as you can never place your telescope parallel with the polar axis. You had better buy Nos. 386 and 389 of the *English Mechanic* for the rudimentary information you appear to require.

Dr. Stanford E. Chaille, a prominent New Orleans physician, has published an article in a medical journal to show the effect of the Mississippi floods on the health of the city. He presents the mortality statistics of twelve overflows, including in each case the deaths for the year, and for the preceding year, and for the following one. After a careful examination of the history, facts, and opinions, he concludes that these "fail to indicate that the partial inundations of New Orleans have ever influenced unfavourably its mortality, whether by yellow fever, by cholera, by malarial fevers, or by diseases generally. On the contrary, the evidence, though imperfect and not fully conclusive, justifies the inference that the deposit and decomposition of filth, and any other promoters of disease which may be due directly to inundations, are more than counterbalanced by the flood, which first covers up the soil, from whence springs so much disease, and then helps to cleanse it."

Science and Art Gossip.

Since the hot season began, sixty-four ship captains have died of yellow fever at the different Cuban ports.

The Census Bureau of Japan reports for 1881 nearly 900,000 births and about 600,000 deaths.

The latest enumeration of Japan's military forces show 43,700 men in the standing army, including the Imperial Guard, and 58,000 Reserves.

An inexhaustible mine of corundum stone, the next hardest known substance to the diamond, has been discovered in Butts County, Ga. It resembles the sapphire, is susceptible of high polish, and is valuable in many ways.

Cholera increases slowly in and about Tokio and Yokohama, Japan. Its ravages are not confined to the poorer classes, several high officials having been attacked. The daughter of Prince Arisugaua, the Emperor's uncle, died after a brief illness.

Swans on the Thames.—The officials of the Crown and Dyers' and Vintners' Companies have just completed the numbering and nicking of the swans on the Thames between Southwark-bridge and Henley. There are now upwards of 400 old birds and cygnets on the upper reaches of the river, nearly 300 of which are the property of the Crown, the remainder being owned by the Vintners' and Dyers' Companies.

Tea Cultivation in New Zealand.—Some time since the Acclimatisation Society of New Zealand invited Mr. Reid, a gentleman connected with the cultivation of tea in India, to make experiments with tea-plants grown in the gardens of the society at Auckland. Mr. Reid did so, and has lately made his report, which is eminently satisfactory, and shows that the plant can be most successfully cultivated in that district.

Mr. Proctor's Lectures on Astronomy.—In reply to several questions, the Editor begs to state that he has agreed to deliver at several places, during the forthcoming lecture season, lectures selected from the following list:—1. Birth and Growth of Worlds; 2. Life and Death of Worlds; 3. The Sun; 4. The Earth-like Planets; 5. The Giant Planets; 6. The Moon; 7. Comets and Meteors; 8. The Star Depths; 9. The Transits of Venus; 10. The Giant Pyramids. All of these can be illustrated with the oxy-hydrogen lantern (where procurable) from Mr. Proctor's collection of more than a thousand photographic slides. The first seven (only) can be illustrated by means of paintings on canvas.

Saving Life.—In consequence of the numerous fatal accidents brought under the notice of the Royal Humane Society by the want of the knowledge of swimming, the committee have resolved to grant a silver medal annually to many of the leading public schools for proficiency in the art with a view to saving life. Rules have been drawn up for the guidance of the head-masters who have signified their cordial approval of the scheme. It is not contemplated to make the medal a personal decoration, as it is considered that that would tend to depreciate the medals of the society intended for saving life from drowning at personal risk. The rules state in effect that a medal will be awarded to each selected school, the competition to be open to all the boys, subject to the approval of the head-master, and to take place in the river or bathing-place used by the school, and to be carried out under the supervision of the head-master, or such umpire as he may appoint. Each boy to have one trial under certain specified conditions. The medal and its accompanying testimonial inscribed on vellum is to be awarded to the boy who obtains the greatest number of marks in the trials.

A Supposed Meteor.—Mr. N. S. Drayton, of Jersey City, writes as follows to the editor of the *Scientific American*:—"On the the evening of the 6th, while engaged in 'sweeping' the vicinity of Ursa Minor for double stars, my attention was drawn to a bright object about the size of a star of the second magnitude moving slowly from west to east. It passed within a degree of Polaris and continued steadily on its course eastward, disappearing from view in the neighbourhood of Capricornus. In colour this object, a meteor, doubtless, was deep red, without scintillations or train of any kind, and its slow movement was in marked contrast with the rapid flashing of the common 'shooting star.' It was visible to me fully three-fourths of a minute, varying but slightly in brightness during that time. In the closeness of my attention to its movement I neglected to note the time of its appearance, but judge it to have been near half-past ten. Perhaps there were other of your readers who observed the phenomenon, and can add more specifically to my testimony."—N. S. Drayton—Jersey City Heights, *July* 8, 1882.

XUM

THE PHAROS AT ALEXANDRIA.—In a letter to the *Times* Mr. J. Buchan Telfer, referring to the Pharos at Alexandria, constructed, according to Weil, on the authority of Ijas, in 1472, says the Arabian writer states that in that year a lighthouse was constructed by Kaitbai, near the old one. It communicated with the city by means of a dyke, and was provided with a house for worship, a mill, and a bakehouse, also a platform from which strange vessels could be seen at the distance of a day's sail, so that time was afforded for preparing the guns with which the tower was supplied to resist their approach. The ancient lighthouse must have been in existence at some period between the years 1425-1427, because Schiltberger, who was there at that time, states that "near the port of Alexandria there is a fine high tower, on which there was not long ago a mirror, &c."; in the middle of that tower "there is a temple." This account is confirmed by Makrizy (1360-1442) who adds that criers were seated around the mirrors to give warning upon the approach of an enemy. Abd Allatif (1161-1231) also testifies to there being a mosque in the tower. It does not appear by the above evidence that the tower of to-day stands on the foundations of the Pharos of Sostratus, which, however, must be hard by, and in all probability not difficult to determine.

MONUMENT TO SIR E. LANDSEER.—The name of Sir Edwin Landseer will no longer be commemorated in St. Paul's Cathedral merely by the granite slab over his grave in the crypt, where his remains were laid to rest near those of Sir Joshua Reynolds, Sir Thomas Lawrence, Benjamin West, Fuseli, and George Dawe, the historical painter. A mural tablet of marble, sculptured by Mr. Woolner, has been placed about twenty paces from the grave of Sir Edwin, in a bay on the south side, in which is John Rennie's tomb, and next to that where Sir Christopher Wren was buried. In the upper part of the monument is a medallion portrait in profile, supported, as it were, by corbels on which appear copies of the heads of the now famous lions in Trafalgar-square. Above the medallion is a moulding enriched with fern leaves, and over this a painter's palette and brushes. The lower part of the monument is a bas-relief from, perhaps, one of the best known of the painter's works —"The Shepherd's Chief Mourner"—which was doubtless chosen as suggesting that feeling of sympathy between man and animals which is characteristic of Sir Edwin Landseer's pictures. Beneath, on a bracket, is the family crest, the head of an eagle holding a key in the beak. The inscription, in small incised and gilded letters, reads:—"Sir Edwin Landseer, R.A., son of John Landseer, A.R.A. Born March 7, 1802. Died October 1, 1873. This monument is erected by his surviving brothers and sisters. 'He hath made everything beautiful in his time.'"

BEES AT SOUTH KENSINGTON.—The eighth exhibition of bees and their produce, hives, and bee furniture was begun on Thursday, August 3rd, at the Royal Horticultural Gardens, South Kensington, by the British Beekeepers' Association. The exhibition will close on Tuesday. The wet season this year has not been favourable for the production of honey, but, owing to the exertions of the association and the local societies, the keeping of bees by cottagers is on the increase. Medals, certificates, and money prizes were competed for in 45 distinct classes grouped under the headings of bees, hives, supers, honey, comb-formation, cottagers' classes, foreign and colonial classes, comestibles, miscellaneous, and driving competion. The display of hives was very large and interesting. In a tent erected in the grounds the driving competition was held. Prizes were given to the competitors who in the neatest, quickest, and most complete manner drove out the bees from a straw skep, and captured and exhibited the queen bee. Neither the competitor nor the judges wore veils. The driver approaches the hive and blows a little brown-paper smoke into the entrance. The bees take fright, and a remarkable instinct leads them to gorge themselves with honey sufficient for two or three days' provision as a preliminary to the exodus which they forsee. In this dull and heavy state the insects are harmless. The manipulator next turns the hive upside down and places an empty hive at an angle of about 45 degrees above it. Then he drums on the lower hive, beating it with his hands; the bees march into the upper hive, leaving the honey behind them. This the honey is garnered (with the exception of the stirrup-cups which the provident creatures have drunk) and the bees are preserved alive. Premature swarms may also be similarly made, thus saving loss of time in waiting for the bees to swarm in the natural way. The important thing is to see that each swarm is provided with an actual or potential queen, since she alone is capable of continuing the race. The workers are females condemned by nature and their early food to a conventual life. The drones are the males, created merely that one should be selected by the queen of his or another hive, and should perish immediately after becoming the object of her violent affection. The unchosen drones are killed or driven out to starve when their brief season is past.

Our Mathematical Column.

EASY LESSONS IN THE DIFFERENTIAL CALCULUS.

No. VII.

BY RICHARD A. PROCTOR.

IN our last lesson we established the general rules for differentiating composite functions, and functions of functions. We now give some examples of the application of these rules. To illustrate the first rule, take the following cases:—

Required the differential coefficient of $a+x-x^2$ with respect to x. The differential coefficient of a is 0; that of x is 1, that of $-x^2$ is $-2x$. Hence

$$\text{if } y=a+x-x^2$$
$$\frac{dy}{dx}=1-2x.$$

Again put $y=(a+x-x^2)\sin x.$

Then the differential coefficient of $(a+x-x^2)$ is $(1-2x)$, and the first portion of the required coefficient is therefore

$$(1-2x)\sin x.$$

Again, the differential coefficient of $\sin x$ is $\cos x$. Hence the second part of the required coefficient is

$$(a+x-x^2)\cos x.$$

We add, according to our first rule, and so we get

$$\frac{dy}{dx}=(1-2x)\sin x+(a+x-x^2)\cos x.$$

Next, to illustrate the second rule, though we shall presently have to go back to the first:—

Let $y=(\sin x)^n.$

Here y is a function of $\sin x$. So that by second rule we treat $\sin x$ as if it were the quantity with respect to which y is to be differentiated. We know that if y were equal to x^n, its differential coefficient would be $n\,x^{n-1}$. Hence in this case we have for the first factor of our coefficient $n\,(\sin x)^{n-1}$. But the rule tells us we are to multiply this by the differential coefficient of $\sin x$, that is by $\cos x$. Hence we have finally

$$\frac{dy}{dx}=n\,(\sin x)^{n-1}\cos x.$$

Take another case.

Let $y=(a^2+x^2)^{\frac{1}{2}}.$

Here y is a function of (a^2+x^2). Hence by the second rule we treat (a^2+x^2) as if it were the quantity with respect to which y is to be differentiated. If y were equal to $x^{\frac{1}{2}}$ we know that its differential coefficient would be $\frac{1}{2}x^{-\frac{1}{2}}$, or $\frac{1}{2x^{\frac{1}{2}}}$. Hence the first factor of the required coefficient is $\frac{1}{2\,(a^2+x^2)^{\frac{1}{2}}}$. We are to multiply this by the differential coefficient of (a^2+x^2),—that is by $2x$. Therefore we have finally

$$\frac{dy}{dx}=\frac{2x}{(a^2+x^2)^{\frac{1}{2}}}=\frac{x}{\sqrt{a^2+x^2}}.$$

Yet one more case of the second rule.

Let $y=\frac{1}{\sin x}$

We know that if y were equal to $\frac{1}{x}$ or x^{-1} its differential coefficient would be $-x^{-2}$, or $-\frac{1}{x^2}$. Hence the first factor of the required coefficient is $-\frac{1}{(\sin x)^2}$. We must multiply this by the differential coefficient of $\sin x$, that is by $\cos x$. Thus we get finally:

$$\frac{dy}{dx}=-\frac{\cos x}{(\sin x)^2}=-\cos x\,\operatorname{cosec}^2 x.$$

This is one of the results already obtained. But observe specially that the differential coefficient of the reciprocal of any quantity may be shown in precisely the same way to be the reciprocal squared multiplied by the differential coefficient of the quantity taken negatively. For example:—

If $y=\frac{1}{a^2+x^2}$

$$\frac{dy}{dx}=-\frac{1}{(a^2+x^2)^2}\times 2x=\frac{-2x}{(a^2+x^2)^2}$$

And now finally (so far as the present lesson is concerned) let us take a case in which both of our rules are applied, but more directly dealt with under sub-rule C, for the case of a function

divided by a function. We will deal with it both ways, as more effectively illustrating this part of our subject.

Let $$y = \frac{\sin x}{\cos x}$$

By the first rule we get at once the first portion of the required coefficient. For, treating cos x as a constant, we take the differential coefficient of sin x, that is, cos x, and get the first portion, viz., $\frac{\cos x}{\cos x}$ or 1.

For the second part we treat sin x as a constant, and have to multiply it by the differential coefficient of the other factor $\frac{1}{\cos x}$.

By what was shown in the preceding case, this is

$$-\frac{1}{\cos^2 x} \times -\sin x, \text{ or } \frac{\sin x}{\cos^2 x}.$$

This multiplied by sin x gives for the second portion $\frac{\sin^2 x}{\cos^2 x}$. Hence the required differential coefficient is

$$1 + \frac{\sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x}$$

This would be obtained at once from rule C, which states that where one function is divided by another, the differential coefficient is equal to

$$\frac{\text{numerator's dif. coefficient}}{\text{denominator}} - \frac{\text{numer.} \times \text{denominator's dif. coefficient}}{(\text{denominator})^2}$$

or we may, as more symmetrical, put the differential coefficient of a fraction in the form—

$$\frac{\text{numerator's dif. coef.} \times \text{denom.} - \text{denominator's dif. coef.} \times \text{numer}}{(\text{denominator})^2}$$

We have now had a good deal of rule-stating and rule-illustrating. In our next we shall apply some of the rules to a few problems of maxima and minima. Probably some readers who have begun to grow weary may be induced, when they see the value of the rules, to master them more thoroughly than they have yet done.

Our Chess Column.

By Mephisto.

SEVENTH GAME IN THE MATCH BETWEEN MESSRS. A. A. BOWLEY AND W. T. PIERCE, OF BRIGHTON.

Giuoco Piano.

White. A. A. Bowley.	Black. W. T. Pierce.	White. A. A. Bowley.	Black. W. T. Pierce.
1. P to K4	P to K 4	17. P to K5	P takes P
2. KKt to B3	QKt to B3	18. P takes P	Q to B3 (*e*)
3. B to B4	B to B4	19. B to B2	R to Qsq
4. P to QB3	P to Q3 (*a*)	20. B to Q4	Kt to Kt3
5. P to Q4	B to Kt3 (*b*)	21. P to K6	Kt to K4
6. B to K3 (*c*)	B to Kt5	22. P takes P (ch)	K takes P
7. B to QKt5	P to QR3	23. B to K4	Q to K3
8. B to R4	P takes P	24. Q to B2 (*f*)	P to Kt4
9. P takes P	B to R4 (ch)	25. QR to Ksq	QKt to B3
10. Kt to B3	P to QKt 4	26. QB takes Kt (*g*)	Kt takes B
11. B to Kt3	Q to B3	27. B to B5	Q to QB3
12. Castles	QB takes Kt	28. R to K3 (*h*)	KR to Ksq
13. P takes B	B takes Kt	29. B to Q7 (*i*)	R takes B
14. P takes B (*d*)	KKt to K2	30. Q to R7 (ch)	K to Bsq
15. K to Rsq	Kt to R4	31. Q to R8 (ch)	K to B2
16. R to KKtsq	P to R3	32. Q to R7 (ch)	

Drawn (*j*).

NOTES.

(*a*) Inferior to 4Kt to B3.

(*b*) 5. P takes P is to be preferred.

(*c*) 6. P takes P, Q to K2 (best). (If P takes P or Kt takes P, Black loses a Pawn.) 7. P takes P, Q takes P (ch). 8. Q to K2, Q takes Q. 9. B takes Q, P takes P, and White's game is slightly to be preferred.

(*d*) White ought to have taken with the Queen, as the exchange of Queens would be in his favour, considering he has a strong centre and two Bishops.

(*e*) If Q takes P, then B to Q4 with a strong attack.

(*f*) White's play is very good, but he now misses his chance. He ought to have played 24. P to KB4, which would have won, *i.e.*:—

24. P to KB4 — 24. P to QB4 (We see nothing better.)
25. B takes Kt — 25. R takes Q
26. QR takes R and White will win in a few moves.

The Black Queen is threatened by B to Q5, and in reply to Q or K moving, White will play R takes Kt P, &c.

(*g*) Probably played absent-minded, for B takes QKt wins a piece.

(*h*) White cannot take the Knight on account of Q takes P (ch) followed on R interposing by R to Q8 (ch), and winning the Queen. 28. R to Kt3 would also have been bad on account of 28. Kt takes P. 29. B to K4, Kt takes R, 30. Q to Kt3 (ch) would be useless, as the Black Queen would cover on B5.

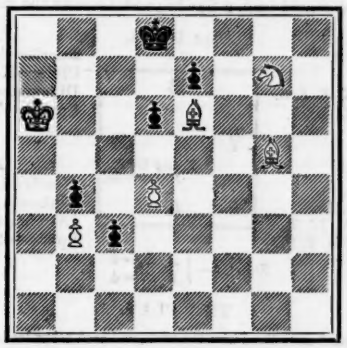
(*i*) An ingenious move, which secures a draw.

(*j*) Black cannot depart from his position, for if he played K to K3, then Q to Kt6 (ch) would win the Queen, *i.e.*, K to Q4. Q to K4 (ch). K to Q3. R to Qsq (ch), and wins. Again, if 32 K to B3, then Q takes RP (ch), and on Kt interposing, Q takes KtP (ch). K to B2, Q to B5 (ch), &c.

PROBLEM No. 50.

By Alfred B. Palmer.

Black.



White.

White to play and mate in four moves.

SOLUTIONS.

End Position, No. 46, by Leonard P. Rees, p. 139.

1. R to Q7 (ch) — 1. K takes R
2. Q to B7 (ch) — 2. R or Kt interposes.
3. Kt to B6 (ch), &c.

Problem No. 47, by Muzio, p. 139.

1. Kt to Kt2 — 1. K to B4
2. R takes P — 2. K to Kt4
3. R to K5 mate

(*a*) 1. K to Q3
2. Kt to B4 and B mates

(*b*) 1. B takes P
2. Kt (ch) and 3B mates.

ANSWERS TO CORRESPONDENTS.

*** *Please address Chess-Editor.*

Leonard P. Rees.—Thanks for Problem and Game. You are right about Problem No. 45. Thanks for your offer, but the indebtedness is really on our side. We, however, accept, under the condition that "we make thee judge," for which purpose we would send you all solutions received.

Ffynone Club.—Colour of men is merely a matter of mutual understanding, but for convenience of notation it is preferable for the first player to have White.

Berrow.—Problem received with thanks.

Alfred B. Palmer.—Game received with thanks.

Correct solutions received of Problem No. 48:—Herbert Jacobs, J. A. Bower and C. H. Lylle, J. K. Milne, Tefsir, Edward B. Norton, Geo. H. Bonner, W. A. Lee. No. 49:—Alfred B. Palmer, Schmenke, J. J. Kaye, John Watson. From Squire, J. K. Milne, J. G. (Dublin), A. R. Johnson, G. Woodcock, Kit, Berrow, A. H. Cooke, E. J. J., Geo. H. Bonner, W. A. Lee.

W. Mead.—No, we have not forgotten.

E. C. H.—Solution wrong.

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Our Whist Column.

By "Five of Clubs."

In the following interesting game, which appeared some eight years ago in the "Westminster Papers," Mr. F. H. Lewis (to whose kindness our readers have already been indebted for several very interesting communications), played hand *Y*. The play is singularly regular in the first ten rounds, the inferences plain and obvious, so that the remaining cards in plain suits could all be placed by all four players. Thus *A* knows that *Y* cannot have the Queen of Spades (or he would have played it at trick 3), so that *Z* having renounced in Spades, it must lie with *B*. He knows that *Y* and *Z* must hold each a Club—it matters not which has the winning Club. *B* knows in like manner that *A* holds the remaining Spade, *Y Z* a Club each. *Y* knows his partner holds the remaining Club, and that *A* and *B* hold each a Spade; and *Z* knows the same about *Y*.

THE HANDS.

A.
Hearts—7, 6, 3.
Clubs—8, 6.
Diamonds—K, 8, 4, 3.
Spades—A, K, 10, 5.

Y.
Hearts—A, Kn, 4.
Clubs—K, Kn, 7, 3.
Diamonds—Q, 6, 5.
Spades—7, 6, 4.

B
Y Z
Trump Card, Heart Nine.
A

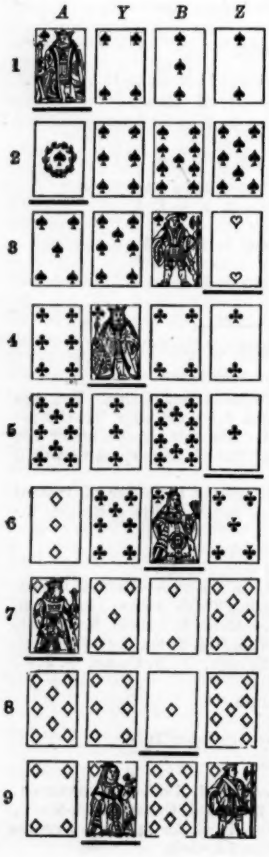
B.
Hearts—K, 8, 5.
Clubs—Q, 10, 4.
Diamonds—A, 10, 2.
Spades—Q, Kn, 9, 3.

Z.
Hearts—Q, 10, 9, 2.
Clubs—A, 9, 5, 2.
Diamonds—Kn, 9, 7.
Spades—8, 2.

Score:— *A, B,* = 4
Y, Z, = 4

THE PLAY.

NOTE.—The card underlined wins the trick, and card below leads next round.



REMARKS, INFERENCES, &c.

1 and 2. *A* leads from his best and longest suit.

3. It is unfortunate for *Z*, with four trumps, to have to ruff; but of course he is wise in doing so at the score, and indeed if the score had been different.

4. *Y* does not hold the Queen.

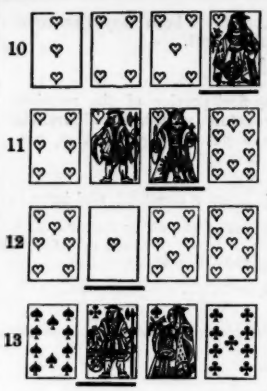
5. As *Y* returns the lowest Club, he holds two more at least. He cannot have played his only remaining Club, for *Z* holds probably two more, certainly not more than two, and *B*, having played the Ten, cannot have any cards left but the Knave or Queen, or both; even in the latter case, a club would be with *Y*, and if there is one there must be another, or *Y* holding two only after first round would have returned the highest. *Y* notes that *B* has not the nine of Clubs (see notes on trick 11).

6. Thus as *Z* does not lead the Queen, *A* places the Queen in B's hand, and discards from his originally weaker suit of the two plain suits remaining.

7. *B* does rightly—at the score—in leading from the suit from which his partner has discarded; it is the best chance of giving *A* a trick by ruffing. *A* does not hold the Queen.

8. It is clear *A* holds the Four, the winning card being with *Y* or *Z*.

9. *B* has very little choice. Leading Spade Queen would be manifestly bad, as *A* (original leader of the suit) holds the only remaining card in it, so that either *Y* or *Z* can ruff, the other making a convenient discard. A trump lead is not likely to do any good, the trumps being



probably pretty equally divided, and the game sure, unless *Y* and *Z* hold both Ace and Queen, and make them separately. As the score and play stand, it is better that either *Y* or *Z* should lead trumps than *A* or *B*.

11. From the lead of the 10, *Y* knows that *Z* does not hold the King, for if he held it he would have played it, unless, besides the Ten, he had held another. But in this case his trumps would been originally King, Queen, Ten, Two, another, in which case (even after being forced) he could certainly have led trumps earlier. Now the King being with the enemy, who hold the remaining Spades, *Y Z* are bound to lose if *Y* takes trick 11. For then, if he leads the Knave of trumps, the King will take it, and a trick in Spades go to *A B*; while if he leads the Knave of Clubs, it will be ruffed (for *A* has already renounced, and *B* does not hold the other Club), and the King of trumps will make the odd trick. *Y* takes the only course to win. Whether the finesse succeed or fail as a finesse (it fails, be it noticed), *A B* must lose both the remaining tricks. This is obvious enough when the cards held by the four players after the tenth round are placed on the table; but how many a game has been lost in such a position by taking a trick at the wrong time.

DOUBLE DUMMY PROBLEM (Page 104).

The second form of solution of this problem, referred to in our last, runs thus:—

Club, trumps.

A—C. 10, 6, 5, 4; D. 10, 9, 8, 7, 6, 5, 4, 3, 2.
Y—C. A, K; H. Q, Kn; D. A, Q; S. K, Kn, 10, 9, 8, 6, 5.
B—C. 9, 8, 7, 3, 2; H. 10, 9, 8, 7, 6, 5, 4, 3.
Z—C. Q, Kn; H. A, K, 2; S. A, Q, 7, 4, 3, 2; D. K, Kn.

NOTE.—The underlined card wins trick, and card below it leads next round.

A	*Y*	*B*	*Z*		*A*	*Y*	*B*	*Z*
D 2	D Q	C 2	D Kn					
C 4	C K	C 3	C Kn					
C 6	H Kn	H 3	H 2	or	D 3	S 6	C 7	S 2
D 3	D A	C 7	D K		C 5	C A	C 8	C Q
C 5	C A	C 8	C Q(*a*)		C 6	S 8*	H 3	S 3
					D 4	D A	C 9	D K
					C 10	H Kn	H 4	H 2

(*a*) Whether *Y* plays a Heart or Spade, *A* is bound to bring in his Diamonds.
* It does not matter what *Y* plays. The working of the above is Loresmith's.

Royal Robber.—Thank you for your kind and encouraging note. We share your admiration for Mr. Lewis's great Whist-playing skill. We hope too, with you, that he may now and then send a double dummy problem for solution.

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